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10/724,817	11/24/2003	Lars Risbo	TI-34411	2748

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EXAMINER	
GHULAMALI, QUTBUDDIN	
ART UNIT	PAPER NUMBER
2611	
NOTIFICATION DATE	DELIVERY MODE
05/14/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	**Application No.** 10/724,817	**Applicant(s)** RISBO ET AL.	
	Examiner Qutbuddin Ghulamali	**Art Unit** 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9-12,15,16,18,19 and 21-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9-12, 15-16, 18-19, 21-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to amendment filed 3/3/2010.

2. The claim objection is withdrawn in view of amendment to claims 18-19.

Response to Remarks/Amendment

3. Applicant's remarks/amendment, see page 8, filed 3/3/2010, with respect to the claim(s) 9-12, 15-16, 18-19 and 21-26 have been fully considered. However, upon further review and consideration, the allowability of claims 9-12, 15-16, 18-19 and 21-26 is regrettably withdrawn in view of newly found art. The rejection follows.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 9-12, 15, 16, 18-19, 21-26, are rejected under 35 U.S.C. 103 (a) as being unpatentable over Sheen (USP 6,404,369) in view of Pellon USP 6,271,781).

Regarding claim 9, Sheen discloses a compensation system programmed to mitigate errors, associated with a digital-to-analog converter (DAC), the compensation system comprising:

a digital error model (fig. 2, DAC error model 222) programmed to provide an emulated error signal as a function of an input signal that is quantized (element 214, fig. 2) (col. 3, lines 15-25; col. 4, lines 35-44), in a predetermined number of one or more levels, the digital error model having parameters adaptively adjusted based on a signal of the conversion system to emulate error characteristics associated at least a portion of the conversion system (col. 4, lines 35-59, 60-67; col. 5, lines 1-11). Sheen further discloses computing emulated values based upon a mathematical model of the DAC 216, the DAC model can also be equipped with additional memory for storing previous states of the DAC and by accounting for both current states and previous states the DAC model can predict and emulate transient errors of the DAC 216. Sheen further discloses a calibration routine can be executed at run-time, and behavioral information about the DAC can be automatically measured and stored in the DAC model 220, the calibration routine is preferably executed on a regular basis, or on demand, to ensure high accuracy in spite of drift in the characteristics of the DAC over time and temperature. Alternatively, behavioral information can be extracted from the DAC 216 during a one-time characterization and permanently stored in a non-volatile memory accessible to the DAC model, the calibration routine is preferably executed at a fixed sampling rate, however, if a user wishes to program the circuit 200 using a variable sample rate, a conventional sample rate converter is preferably included to convert the

variable sample rate to a fixed sample rate prior to application to the sigma-delta DAC circuit 200 (col. 4, lines 62-67; col. 5, lines 1-20). Sheen fails to disclose providing a calibration signal free in band frequencies (errors) the calibration system calibrates the parameters of the digital error model during calibration mode based on content of an output signal of the conversion system in response to calibration signal that is provided to the conversion system. However, Pollen in a similar field of endeavor discloses a dynamic error calibrator (280, fig. 2) provide a dynamic error calibration signal (224) that is substantially free of in band frequencies (see block 280 that includes 284) by adapting the parameters of the digital error model during calibration based on content of output signal of the conversion system in response to calibration signal provided to the conversion system (col. 7, lines 25-67; col. 8, lines 1-6). A person of ordinary skill in the art at the time the invention was made would have been motivated to use the teaching of Pellon for providing a calibration signal to the conversion system with Sheen because it can allow to compensate for differences in errors which can be attributable to parameters of active elements of the compensation system.

Regarding claims 10, 22, Sheen discloses the calibration system further comprising an estimator (sigma delta loop compares) operative to minimize error in the output signal by adjusting the parameters of the digital error model based on at least one of the input signal and the output signal of the conversion system (col. 2, lines 25-42).

Regarding claims 11, 23, Sheen discloses the output signal of the conversion system corresponds to a residual error signal (Es) that minimizes as the digital error

model better approximates error characteristics of the conversion system (fig. 2, 222, Es).

Regarding claims 12, 24, Sheen discloses a filter that filters the output signal of the conversion system to provide the residual error signal substantially free of out-of-band frequencies (the error signal is driven to zero) (col. 1, lines 45-67).

Regarding claim 15, Sheen discloses a conversion system comprising:

a modulator that provides a quantized signal (214) that is quantized in a predetermined number of one or more levels (fig. 2, DAC error model 222, 214);

a digital error model (fig. 2, DAC error model 222) programmed to provide an emulated error signal to the modulator as a function of the quantized signal, the digital error model having parameters adaptively adjusted based on a signal of the conversion system to emulate error characteristics (col. 3, lines 15-25; col. 4, lines 35-44);

a digital-to-analog converter (DAC) (216) coupled to receive the quantized signal (214) and to convert the quantized signal to a corresponding analog output signal (implied, result of D/A conversion is analog), the error characteristics being error characteristics associated with the DAC (col. 4, lines 35-59, 60-67; col. 5, lines 1-11). Sheen fails to disclose providing a calibration signal free in band frequencies (errors) the calibration system calibrates the parameters of the digital error model during calibration mode based on content of an output signal of the conversion system in response to calibration signal that is provided to the conversion system. However, Pollen in a similar field of endeavor discloses a dynamic error calibrator (280, fig. 2) provide a dynamic error calibration signal (224) that is substantially free of in band frequencies (see block 280

that includes 284) by adapting the parameters of the digital error model during calibration based on content of output signal of the conversion system in response to calibration signal provided to the conversion system (col. 7, lines 25-67; col. 8, lines 1-6). A person of ordinary skill in the art at the time the invention was made would have been motivated to use the teaching of Pellon for providing a calibration signal to the conversion system with Sheen because it can allow to compensate for differences in errors which can be attributable to parameters of active elements of the compensation system.

Regarding claims 16, 18, 25, Sheen discloses a compensation system programmed to mitigate errors associated with a conversion system, the compensation system comprising:

a digital error model (222, fig. 2) programmed to provide an emulated error signal (Es) as a function of an input signal that is quantized (quantizer 214) in a predetermined number of one or more levels, the digital error model having parameters adaptively adjusted based on a signal of the conversion system to emulate error characteristics associated with at least a portion of the conversion system (col. 4, lines 35-59, 60-67; col. 5, lines 1-11);

a digital-to-analog converter (DAC) (216, fig. 2) coupled to receive the input signal that is quantized (214) in the predetermined number of levels and to convert the input signal to a corresponding analog output signal, the error characteristics being error characteristics associated with the DAC. Sheen further discloses computing emulated values based upon a mathematical model of the DAC 216;

an analog filter (224) that substantially removes out-of-band frequencies and quantization noise from the corresponding analog output signal, and provides a filtered analog signal (analog out) (col. 1, lines 40-67). Sheen however, fails to disclose an analog-to-digital converter that receives and converts the filtered analog signal into a corresponding digital representation of the filtered signal; and

a calibration system that calibrates the parameters of the digital error model as a function of the digital representation of a filtered calibration signal so as to mitigate errors in the digital representation of the filtered calibration signal, wherein a calibration signal that corresponds to the filtered calibration signal is substantially free of in-band frequencies. However, Pellon in a similar field of endeavor discloses an analog-to-digital converter (fig. 2, 216, 236) that receives and converts the filtered analog signal into a corresponding digital representation (y(n)) of the filtered signal (col. 6, lines 7-16); a calibration system (calibrator 280, fig. 2) provide a dynamic error calibration signal (224) that is substantially free of in band frequencies (see block 280 that includes 284) by adapting the parameters of the digital error model during calibration based on content of output signal of the conversion system in response to calibration signal provided to the conversion system (col. 7, lines 25-67; col. 8, lines 1-6). A person of ordinary skill in the art at the time the invention was made would have been motivated to use the teaching of Pellon for providing a calibration signal to the conversion system with Sheen because it can allow to compensate for differences in errors which can be attributable to parameters of active elements of the compensation system.

Regarding claim 19, Sheen and Pellon combined disclose substantially all limitations of the claim above. Pellon however, further discloses a digital filter that substantially removes out-of-band frequencies in the corresponding digital output signal of the ADC, and the digital filter provides a filtered digital signal (col. 9, lines 21-31); and a calibration system that calibrates the parameters of the digital error model as a function of the filtered digital signal by adaptively adjusting the parameters of the model to mitigate errors in the filtered digital signal (col. 7, lines 25-67; col. 8, lines 1-6). A person of ordinary skill in the art at the time the invention was made would have been motivated to use the teaching of Pellon for providing a calibration signal to the conversion system with Sheen because it can allow to compensate for differences in errors which can be attributable to parameters of active elements of the compensation system.

Regarding claim 21, Sheen discloses a conversion system comprising:

a noise shaping filter that provides a noise-shaped signal for conversion to a corresponding output signal of the conversion system (col. 5, lines 60-67; col. 6, lines 1-27);

a model (222, fig. 2) operative to provide a compensation error signal (Es) into the conversion system (200) based on a digital representation of the noise shaped signal having a plural quantization levels (col. 3, lines 15-25; col. 5, lines 60-67) Sheen however, fails to disclose a calibration system that calibrates the parameters of the digital error model as a function of the digital representation of a filtered calibration signal so as to mitigate errors in the digital representation of the filtered calibration

signal, wherein a calibration signal that corresponds to the filtered calibration signal is substantially free of in-band frequencies. However, Pellon in a similar field of endeavor discloses an analog-to-digital converter (fig. 2, 216, 236) that receives and converts the filtered analog signal into a corresponding digital representation (y(n)) of the filtered signal (col. 6, lines 7-16);

a calibration system (calibrator 280, fig. 2) provide a dynamic error calibration signal (224) that is substantially free of in band frequencies (see block 280 that includes 284) by adapting the parameters of the digital error model during calibration based on content of output signal of the conversion system in response to calibration signal provided to the conversion system (col. 7, lines 25-67; col. 8, lines 1-6). A person of ordinary skill in the art at the time the invention was made would have been motivated to use the teaching of Pellon for providing a calibration signal to the conversion system with Sheen because it can allow to compensate for differences in errors which can be attributable to parameters of active elements of the compensation system.

Regarding claim 26, Sheen discloses all limitations of the claim above. Sheen further discloses a DAC (fig. 2, DAC 216) further comprising a quantized (quantizer 214) that provides a quantized signal based on the noise shaped signal, the quantized signal defining the digital representation of noise shaped signal (col. 5, lines 60-67; col. 6, lines 1-28);

a DAC (216) that converts the quantized signal (214) to a corresponding analog signal that defines the output signal of the conversion system, the error characteristics being error characteristics associated with the DAC; and the error model (222) providing the

emulated error signal (Es) to the noise shaping filter as a function of the quantized signal (col. 3, lines 54-67; col. 4, lines 1-2).

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Qutbuddin Ghulamali whose telephone number is (571)-272-3014. The examiner can normally be reached on Monday-Friday, 7:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh M. Fan can be reached on (571) 272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

QG.

May 6, 2010.

/CHIEH M FAN/
Supervisory Patent Examiner, Art Unit 2611